

CLAIMS

What is claimed:

1 1. A transistor gate dielectric comprising:

2 a first dielectric material having a first dielectric
3 constant; and

4 a second dielectric material having a second dielectric
5 constant different from the first dielectric constant.

1 2. The transistor gate dielectric of claim 1, wherein the
2 second dielectric constant is greater than the first dielectric
3 constant.

1 3. The transistor gate dielectric of claim 1, wherein the
2 first material has a first thickness and the second material has
3 a second thickness, the combination of the first thickness and
4 the second thickness defining a total thickness less than one-
5 third of the length of a transistor gate adapted to overly the
6 gate dielectric.

1 4. The gate dielectric of claim 3, wherein the first material
2 thickness and the second material thickness are determined by
3 the relationship

4
$$t_1/k_1 + t_2/k_2 = t_{ox}/k_{ox}$$

5 wherein t_1 is the first material thickness,
6 t_2 is the second material thickness,
7 t_{ox} is the minimum thickness for a gate dielectric of
8 silicon dioxide for a chosen gate length,
9 k_1 is the dielectric constant for the first dielectric
10 material,
11 k_2 is the dielectric constant for the second
12 dielectric material, and
13 k_{ox} is the dielectric constant of silicon dioxide.

1 5. The gate dielectric of claim 1, wherein the first gate
2 dielectric material is selected from one of silicon nitride,
3 HfO_2 , BaO , La_2O_3 , Y_2O_3 , and ZrO_2 .

1 6. The gate dielectric of claim 1, wherein the second
2 dielectric material is selected from one of BST and PZT.

1 7. The gate dielectric of claim 1, further comprising a third
2 dielectric material having a third dielectric constant.

sub 1 8. A transistor having a gate electrode overlying a gate
2 dielectric comprising:

3 a first dielectric material having a first dielectric
4 constant; and

5 a second dielectric material having a second dielectric
6 constant different from the first dielectric constant.

1 9. The transistor of claim 8, wherein the second dielectric of
2 the gate dielectric has a dielectric constant greater than the
3 first dielectric constant.

1 10. The transistor of claim 8, wherein the first material of
2 the gate dielectric has a first thickness and the second
3 material of the gate dielectric has a second thickness, the
4 combination of the first thickness and the second thickness
5 defining a total thickness less than one-third of a length of
6 the transistor gate electrode.

1 11. The transistor of claim 8, wherein the first material
2 thickness and the second material thickness are determined by
3 the relationship

$$t_1/k_1 + t_2/k_2 = t_{ox}/k_{ox}$$

5 wherein t_1 is the first material thickness,

6 t_2 is the second material thickness,

7 t_{ox} is the minimum thickness for a gate dielectric of
8 silicon dioxide for a chosen gate electrode length,

9 k_1 is the dielectric constant for the first dielectric
10 material,

11 k_2 is the dielectric constant for the second
12 dielectric material, and

13 k_{ox} is the dielectric constant of silicon dioxide.

1 12. The transistor of claim 8, wherein the first gate
2 dielectric material is selected from one of silicon nitride,
3 HfO_2 , BaO , La_2O_3 , Y_2O_3 , and ZrO_2 .

1 13. The gate dielectric of claim 8, wherein the second
2 dielectric material is selected from one of BST and PZT.

1 14. The gate dielectric of claim 8, further comprising a third
2 dielectric material having a third dielectric constant.

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